

his splurge of freedom from school by stalking for minnows, frogs, perhaps a lumbering turtle. The talkative redwinged blackbirds, their nests empty now of eggs and baby birds, flicker their wings and scold him, swinging uproariously on brown stalks of the cattails, those marshy plants with brown velvet spikes which are just now beginning to open and release the white downy seeds.

Subtle inhabitant of the pond is the bittern, a hump-shouldered big brown bird which does not panic at the approach of human footsteps but quietly lifts its long neck and bill skyward and, motionless, melts into the scenery—for on the under part of his neck stretch brown and tan stripes that camouflage him to look like the leaves and stems of the rushes.

The dragon fly stitches through the simmering heat of the pond on radiant wings. The smaller, more slender damselfly also slips over the pond, giving blue, green and red streaks to the sunlit air.

Deep in the woods, cool shadows from trees fall upon the moist fertile soil. Softly growing mosses form springy carpets, and

flat liverworts sprawl in primeval crudeness close to the ground, their liver-shaped leaves spreading slowly and reproducing in spores much as the same plant did millions of years ago, even before the dinosaurs walked the earth.

Denizens of cool quiet places, the ferns have long unfurled their fiddle headed shoots, and formed green patterns—lacy designs of the maidenhair ferns, dense knee-deep stands of bracken, tiny elfin gardens of rock-clinging polypody.

Overhead the woods echo with sounds from ovenbirds, vireos, thrushes, chickadees, and the sassy tongues of brazen bluejays.

With eery translucent whiteness, waxy Indian pipes gleam from the darkness of the shadowy woods. These beautiful saprophyte plants, quietly drinking vital food from the decaying remains of logs and other dead plants, are part of the marvelous balance of nature which has evolved a rhythm of using the death of its creatures to recreate life of others—a perpetual symphony of birth, growth and then death that gives rise again to the beauty of new life.

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## SPACE

## Cure Engines in Flight

➤ AN ELECTRONIC “DOCTOR” has been designed to keep an eye on rocket engines during flight and to lend a helping hand when problems arise.

READI (Rocket Engine Analyzer and Decision Instrumentation), developed for the National Aeronautics and Space Administration by Sperry Gyroscope Company, Great Neck, N.Y., can either alert a spacecraft pilot to trouble or take matters into its own hands.

Just like your family doctor, READI has a set of instruments, or sensors, that provide information about the patient's welfare. A central logic box considers all the information and takes appropriate action.

A typical problem might be combustion instability in one of a cluster of rocket engines. This might result in a hole burned through the engine wall.

READI could consider the problem, and then elect, for example, to shut off the engine and restart it. Another solution within the scope of READI would be to redistribute the fuel among other engines.

Just the sort of situation in which READI would be useful occurred on May 28, when one of the eight first-stage engines in a giant Saturn rocket stopped firing 24 seconds before it should have. Fortunately, new fuel and guidance systems were able to keep the rocket on course. READI, however, could analyze the problem in a fraction of a second.

James R. Lamb Jr. of Sperry told SCIENCE SERVICE that READI would automatically consider whether it was safer to continue the flight as planned, to follow an alternate plan, or to abort the mission altogether and destroy the rocket. Though still experimental, READI can handle problems ranging from liquid oxygen leaks to fires, from vibration to loss of gas pressure.

The “rocket doc” has been tested in the laboratory, and is at present being simulated in a computer version on the J-2 engine, the type that will power the second and third stages of the Saturn launch vehicle carrying the first Americans to the moon.

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## SPACE

## Saturn Booster Useful Beyond Moon Program

➤ THE CAREER of the Saturn S-1 rocket will be far from over once it has boosted three Americans off on their journey to the moon.

Modifications of the original S-1 design can carry greatly increased payloads and perform far longer missions, said Dr. D. N. Buell, chief of advance engineering for Chrysler Corporation's space division in New Orleans.

The basic Saturn 1-B can put a 35,000 pound payload in an orbit 100 miles above the earth.

When a Centaur rocket is attached as an additional stage, it can carry 24,000 pounds into an orbit 2,000 miles up.

The same system can put 14,000 pounds in an orbit around the moon, and is even capable of carrying 10,000 pounds in a fly-by of the planet Mars.

A Saturn 1-B, “up-rated” with two 120-inch solid fuel booster motors, could reach the original 100 mile orbit with a payload as high as 66,500 pounds. If the “up-rated” version were combined with a Centaur, it could carry 30,000 pounds, three times the original payload, past Mars on a fly-by mission.

Not all of these modifications would involve vast new sums of money, said Dr.

Buell. A 30-foot extension of the fuel tanks could be accomplished with virtually no additional tooling costs. A reasonable development program could result in a 25% increase in thrust for the 1-B. Combined, these two items could enable 60,000 pounds to go into that 100-mile orbit, at minimum additional expense.

However, these various programs are not due for some time. They have been studied, and suggestions have been submitted to the National Aeronautics and Space Administration. Right now NASA is concentrating on using Saturn to put men on the moon.

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## TECHNOLOGY

## New Standard Weights Of Stainless Steel

➤ A POUND of stainless steel is better than a pound of brass, when it comes to making standard and precise weights.

With a new kind of stainless steel developed by Allegheny Ludlum Steel Corporation in Pittsburgh, accurate weights from one-millionth of a pound to 50 pounds now will not corrode, erode, tarnish or react in any way so that the mass value is seriously affected.

Shining sets of the standardized weights have been made from the new metal for the Office of Weights and Measures of the National Bureau of Standards. Other sets will be produced for use in Federal, state and municipal offices, as well as in industry, business and educational institutions.

Brass, the traditional metal for weights, sometimes changes weight.

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## Nature Note

### Catfish

➤ CATFISH are careful parents. Many of them build nests and take care of their young after they hatch. Freshwater catfish can sometimes be seen near the edge of lakes in early summer as one of the parents, usually the father, patiently swims near his brood of finger-sized, dark-colored offspring.

There are about two dozen kinds of catfish in the world. Our North American catfish belong to two families—the freshwater Ictaluridae and the saltwater Ariidae.

Many catfish males carry the eggs in their mouths, sometimes for a few months. After the eggs hatch, the male catfish carries on with his parental duty by following the tiny offspring, opening his mouth for them to flee inside at the first sign of danger.

Called catfish because of the whiskers around their head, the North American fish are scaleless—an unusual condition which has given rise to many superstitions about them including the nickname, children of the devil.

Catfish have spines in the fins which can cut the hand of a careless angler. A gland near the base of the spine secretes a venom that increases the swelling and painfulness of the wound.

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